

Prepared in cooperation with the  
**TENNESSEE VALLEY AUTHORITY**

# **Estimated Use of Water in the Tennessee River Watershed in 2000 and Projections of Water Use to 2030**

**Water-Resources Investigations Report 03-4302**



Cover photographs courtesy of the Tennessee Valley Authority. Used with permission.

# Estimated Use of Water in the Tennessee River Watershed in 2000 and Projections of Water Use to 2030

By Susan S. Hutson, M. Carolyn Koroa, and C. Michael Murphree

---

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 03-4302

Prepared in cooperation with the  
TENNESSEE VALLEY AUTHORITY

Nashville, Tennessee  
2004

**U.S. DEPARTMENT OF THE INTERIOR  
GALE A. NORTON, SECRETARY**

**U.S. GEOLOGICAL SURVEY  
Charles G. Groat, Director**

Any use of trade, product, or firm name in this report is for identification purposes only and does not constitute endorsement by the U.S. Government.

---

For additional information write to:

District Chief  
U.S. Geological Survey  
640 Grassmere Park, Suite 100  
Nashville, Tennessee 37211

Copies of this report may be purchased from:

U.S. Geological Survey  
Branch of Information Services  
Box 25286  
Denver, Colorado 80225-0286

# CONTENTS

Abstract.....	1
Introduction .....	2
Purpose and scope .....	2
Hydrologic setting .....	4
Sources of data and methods of analysis.....	5
Acknowledgments .....	8
Water use .....	9
Instream use .....	10
Total offstream water use.....	11
Thermoelectric power.....	41
Industrial .....	45
Public supply .....	53
Irrigation .....	62
Projections of water use .....	68
Trends in water use.....	73
Summary.....	76
Selected references .....	77
Glossary.....	81
Appendix A. Water-use data sources for the Tennessee River watershed in 2000.....	87
Appendix B. Hydrologic unit codes and names .....	88
Appendix C. Improving hydropower and water quality at the Tennessee Valley Authority dams .....	89

## FIGURES

1-5. Maps showing:	
1. Total freshwater withdrawals per square mile and percent consumptive loss in the conterminous United States by watershed region in 1995 .....	3
2. The Tennessee River watershed and major tributaries .....	4
3. Reservoir catchment areas in the Tennessee River watershed.....	6
4. The 8-digit hydrologic unit codes of the Tennessee River watershed .....	7
5. States and counties in the Tennessee River watershed .....	8
6. Schematic showing the interrelation of water-using entities and water-use transactions to sources of supply .....	9
7. Graphs showing source and disposition of total water use in the Tennessee River watershed in 2000 .....	11
8. Maps showing total water withdrawals by source and by hydrologic unit in the Tennessee River watershed in 2000.....	12
9. Schematic showing cumulative consumptive use at major water-use tabulation area junctures and net water demand for reservoir catchment areas in the Tennessee River watershed in 2000.....	13
10. Map showing intensity of per capita use withdrawals by hydrologic unit in the Tennessee River watershed in 2000.....	14
11. Schematic showing source, use, and disposition of water in the Tennessee River watershed in 2000 .....	15
12. Graph showing comparison of water withdrawal and consumptive use by category, in million gallons per day, in the Tennessee River watershed in 2000 .....	16
13. Graph showing disposition of water used by thermoelectric power plants in the Tennessee River watershed in 2000.....	41
14-15. Maps showing:	
14. Distribution of thermoelectric power plants in the Tennessee River watershed in 2000 .....	42
15. Thermoelectric power water withdrawals by hydrologic unit in the Tennessee River watershed in 2000.....	44

16.	Graphs showing source and disposition of water used by industry in the Tennessee River watershed in 2000 .....	45
17-18.	Maps showing:	
17.	Industrial water withdrawals by source and by hydrologic unit in the Tennessee River watershed in 2000 .....	46
18.	Industrial water withdrawals by State and county in the Tennessee River watershed in 2000.....	47
19.	Graphs showing source and disposition of water used for public supply in the Tennessee River watershed in 2000 .....	53
20-21.	Maps showing:	
20.	Public-supply withdrawals by source and by hydrologic unit in the Tennessee River watershed in 2000 .....	54
21.	Population distribution in the Tennessee River watershed and surrounding areas by county in 2000 .....	55
22.	Graph showing source of water used for irrigation in the Tennessee River watershed in 2000 .....	62
23.	Maps showing irrigation withdrawals by source and by hydrologic unit in the Tennessee River watershed in 2000 .....	63
24.	Schematic showing projected cumulative consumptive use at major water-use tabulation area junctures in the Tennessee River watershed in 2030.....	70
25.	Maps showing projected percent and volume increases in water withdrawals by reservoir catchment area in the Tennessee River watershed from 2000 to 2030 .....	71
26-28.	Graphs showing:	
26.	Projected percent increase in industrial and public-supply water use in the Tennessee River watershed from 2000 to 2030 .....	72
27.	Trends in surface- and ground-water withdrawals and population for 1965 to 2000, and projection of total water withdrawal in 2030 for the Tennessee River watershed .....	74
28.	Trends in water withdrawal by water-use category from 1965 to 2000, and projected total withdrawal, 2030, for the Tennessee River watershed.....	75

## TABLES

1.	Total offstream water use by water-use tabulation area in 2000 .....	17
2.	Total offstream water use by hydrologic unit in 2000 .....	19
3.	Total offstream water use by county in 2000 .....	20
4.	Total water use by category and water-use tabulation area in 2000.....	23
5.	Total water use by category and hydrologic unit in 2000 .....	25
6.	Total water use by category and county in 2000.....	26
7.	Surface-water withdrawal by category and water-use tabulation area in 2000.....	29
8.	Surface-water withdrawal by category and hydrologic unit in 2000 .....	31
9.	Surface-water withdrawal by category and county in 2000 .....	32
10.	Ground-water withdrawal by category and water-use tabulation area in 2000.....	35
11.	Ground-water withdrawal by category and hydrologic unit in 2000 .....	37
12.	Ground-water withdrawal by category and county in 2000 .....	38
13.	Thermoelectric power water use by water-use tabulation area in 2000 .....	41
14.	Thermoelectric power water use by hydrologic unit in 2000 .....	43
15.	Thermoelectric power water use by county in 2000 .....	43
16.	Industrial water use by water-use tabulation area in 2000 .....	48
17.	Industrial water use by hydrologic unit in 2000.....	50
18.	Industrial water use by county in 2000 .....	51
19.	Public-supply water use by water-use tabulation area in 2000 .....	56
20.	Public-supply water use by hydrologic unit in 2000.....	58
21.	Public-supply water use by county in 2000 .....	59
22.	Irrigation withdrawal by water-use tabulation area in 2000 .....	64
23.	Irrigation withdrawal by hydrologic unit in 2000 .....	65
24.	Irrigation withdrawal by county in 2000.....	66
25.	Water-use projections for the Tennessee River watershed by water-use tabulation area in 2030.....	68
26.	Trends of estimated water use in the Tennessee River watershed, 1965 to 2030 .....	73

## CONVERSION FACTORS, DATUM, AND ACRONYMS

Multiply	By	To Obtain
	<u>Area</u>	
acre	43,560	square foot ( $\text{ft}^2$ )
acre	4,047	square meter ( $\text{m}^2$ )
acre	0.001562	square mile ( $\text{mi}^2$ )
square mile ( $\text{mi}^2$ )	2.590	kilometer square ( $\text{km}^2$ )
	<u>Flow</u>	
gallon per day (gal/d)	3.785	liter per day
million gallons per day (Mgal/d)	1.121	thousand acre-feet per year
million gallons per day (Mgal/d)	0.001547	thousand cubic feet per second
million gallons per day (Mgal/d)	0.6944	thousand gallons per minute
million gallons per day (Mgal/d)	0.003785	million cubic meters per day
million gallons per day (Mgal/d)	1.3815	million cubic meters per year
thousand acre-feet per year	0.8921	million gallons per day
thousand acre-feet per year	0.001380	thousand cubic feet per second
thousand acre-feet per year	0.6195	thousand gallons per minute
thousand acre-feet per year	0.003377	million cubic meters per day

Selected water equivalents in inch-pounds units are listed below:

1 gallon	=	8.34 pounds
1 million gallons	=	3.07 acre-feet
1 cubic foot	=	62.4 pounds
	=	7.48 gallons
1 acre-foot (acre-ft)	=	325,851 gallons
	=	43,560 cubic feet
1 inch of rain	=	17.4 million gallons per square mile
	=	27,200 gallons per acre
	=	100 tons per acre

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

## ACRONYMS

DOE, EIA	U.S. Department of Energy, Energy Information Administration
GIS	Geographic information system
HUC	Hydrologic unit code
NWUIP	USGS National Water-Use Information Program
POTW	Publicly owned treatment works
RCA	Reservoir catchment area
TVA	Tennessee Valley Authority
TVA-WUDS	Tennessee Valley Authority Water-Use Data System
USACE	United States Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USEPA, NPDES, PCS	U.S. Environmental Protection Agency, National Pollutant Discharge Elimination System, Permit Compliance System
USGS	U.S Geological Survey
WRR	Water-resources regions
WUTA	Water-use tabulation area

